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Journal of the Society of Arts.

FRIDAY, MAY 4, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'Clock:—

May 9.—"On the Progress of Fire-arms for Military Purposes to their Present State." By Colonel E. C. Wilford, late Assistant-Commandant and Chief Instructor at the Hythe School of Musketry.

May 16.—*Derby Day*—No Meeting.

Cantor Lectures.

The concluding lecture of the course "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," will be delivered this evening by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture IV.—Friday, May 4th.

"On the Artificial Production of Aromatic Substances."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet, coumarin,* and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen,* or *gaultheria*—On the transformation of *indigo,* the *oil of potatoes,* and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor;* of the essential oil of *mustard* into that of *garlic,* &c., &c., &c.

The lecture commences at eight o'clock, and is open to members, each of whom has the privilege of introducing one friend.

The substance of these lectures will appear in the *Journal* during the autumn.

Central Hall of Arts and Sciences.

The arrangements for erecting a Great Central Hall of Arts and Sciences at Kensington, on the ground purchased out of the profits of the Exhibition of 1851, having been carried so far as to secure the erection of that building, it has been thought desirable that members of the Society of Arts should be put in possession of full information on the subject, in case they should desire to invest in the property, before the whole of the available seats are disposed of. A copy of the prospectus was, therefore, forwarded to each member with the last number of the *Journal,* and the Secretary of the Society will afford any further information on the subject if applied to. A model of the Hall is now on view at the Society's house.

Prizes for Art-Workmen.*

The Council of the Society of Arts hereby offer Prizes for Art-Workmanship, according to the following conditions:—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or, if sold previously to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed, the candidates must be prepared to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bona-fide* Art-workmen only can receive prizes.

VI. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

VIII. All the prizes are open to male and female competitors, and in addition, as regards painting on porcelain, decorative painting, and wall mosaics, a second set of prizes, of the same amounts, will be awarded among female competitors. If a female desire to compete in the female class only, she must declare her intention accordingly. The originals of the works prescribed may be seen at the South Kensington Museum, in the gallery at the entrance to the Sheepshanks pictures.

Casts may be seen at the Society of Arts, Adelphi, London, and the Schools of Art at Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries.

Photographs, chromolithographs, engravings, rough casts in metal, &c., may be purchased at the Society of Arts, John-street, Adelphi, at the prices named.

The plaster casts of the examples in classes 2 and 4 may be obtained from Mr. Franchi, 15, Myddelton-street, Clerkenwell, E.C.; the other casts from Mr. D. Brucciani, 39, Russell-street, Covent-garden, W.C.

⁂ The Council are happy to announce that several of the works which received first prizes in the competitions of 1863, 1864, 1865, and 1866, have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

FIRST DIVISION.

Works to be Executed from Prescribed Designs.

For the successful rendering of the undermentioned designs in the various modes of workmanship according to the directions given in each case.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work executed in marble or stone, after part of a frieze of a chimney-piece, by *Donatello,* No. 5,795, in the South

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* The Worshipful Company of Salters contribute £10 annually to this Prize Fund. The North London Exhibition Prize consists of the interest of £167 7s. 3d. Consols, invested in the name of the Society of Arts, to be awarded by the Council "for the best specimen of Skilled Workmanship" at the Society's Exhibition of the works sent in for the Prizes named above.

Kensington Museum; or the "Boy and Dolphin, cast from a chimney-piece, ascribed to *Donatello;* original in the South Kensington Museum, No. 5,896. Dimensions—two-thirds the size of the cast (linear).—The design may be adhered to strictly or adapted to any architectural purpose.

[Cast—Fifteen Shillings; Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best work, executed in marble, stone, or wood after a carved chair-back in the South Kensington Museum. Dimensions—To be two-thirds of the cast (linear).

[Cast—Twelve Shillings. Photograph—One Shilling.]

(*c.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed in stone, after a *Gothic bracket* in the Architectural Museum. Dimensions the same as the cast. In this design the details may be improved by the introduction of small animals, and the human head may be changed according to the taste of the art-workman.

[Cast—Ten Shillings; Photograph—One Shilling.]

(*d.*)—One prize of £20 for the best, and a second prize of £10 for the next best, work carved in *wood* after a design by *Holbein,* as an *Inkstand* or *Watch-Holder* on three feet. Dimensions—Optional.

[Wood Engraving—Sixpence.]

(*e.*)—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work carved in wood after the *Head of a Harp* of the period of Louis XVI., in the South Kensington Museum, No. 8,531. The head and bust only need be fully completed. Dimensions—The same as the cast.

[Cast—Thirty Shillings; Photograph—One Shilling.]

(*f.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best, work carved in wood after an *Italian picture frame* in the possession of Henry Vaughan, Esq. Dimensions optional.—This design may be adhered to strictly or adapted in such manner as the workman may think fit.

[Photograph—Two Shillings.]

(*g.*) *Ornament carved and gilt.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed in wood, carved and gilt after a *Console Table* in the South Kensington Museum, No. 6947, of the period of Louis XVI. The work to be carved roughly in wood, then to be prepared in the white by a gilder, then cut up or carved in the white by the carver, then to be gilt in mat and burnished gold. As such work may probably be executed by two persons, the prize will be apportioned as the judges may determine.

[Photograph—One Shilling.]

CLASS 2.—REPOUSSÉ WORK IN ANY METAL.

(*a.*) *The Human Figure as a bas-relief.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after the Martelli Bronze Mirror Case, No. 8,717, in the South Kensington Museum—dimensions, 6¾ inches diameter. The whole or any sufficient part thereof the size of the original; or Raphael's "Three Graces."—Dimensions—The figures to be six inches high.

[Cast of Mirror Case—Two Shillings; Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a tazza in silver, date 1683, the property of Sir W. C. Trevelyan, Bart., now in the South Kensington Museum. Dimensions—The same as the model.

[Photograph—One Shilling.]

CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.

Ornament.—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after the portion shown in the photograph of the Pediment of a Gate (German work, date about 1700) in the South Kensington Museum, No. 5,979. To be adapted for use as a bracket. Dimensions—Twelve inches deep.

If the work is executed in brass or copper, it will be rendered subject to the conditions of these metals, either as split and riveted or partly beaten from the sheet, and the awards will be made in view of these conditions.

[Photograph—One Shilling and Threepence.]

CLASS 4.—CARVING IN IVORY.

(*a.*) *Human Figure in the round.*—One prize of £15 for the best, and a second prize of £10 for the next best, work executed after an ivory plaque of Bacchus and Amorini, by *Fiamingo,* No. 1,059, in the South Kensington Museum; dimensions—five inches greatest length; or after a medallion portrait of Flaxman, by himself, No. 294 in the South Kensington Museum. Dimensions—To be reduced in height by one-half (linear).

[Cast of the Plaque—Two Shillings; and Photograph of the Plaque or of Medallion—One Shilling each.]

(*b.*) *Ornament.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after a pair of *Tablets,* in the possession of John Webb, Esq. Dimensions—The same as the cast.

[Cast—One Shilling.]

CLASS 5.—CHASING IN BRONZE.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a reduced copy of "*Clytié.*" A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price—£2 10s.

[Plaster Cast—Three Shillings and Sixpence.]

(*b.*) *Ornament.*—One prize of £10 for the best, and a second prize of £7 10s. for the next best, work executed after *Goutier,* from a cabinet in the possession of Her Majesty the Queen. A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price—3s. 6d.

[Plaster Cast—One Shilling.]

CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.

Ornament.—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after arabesques by Lucas Van Leyden, A.D. 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the photograph, and, if round a cup or goblet, repeated so as to be not less than nine inches in length when stretched out.

[Photograph—Sixpence.]

CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's design of the* "*Three Graces,*" executed in *grisaille.* Dimensions—The figures to be four inches high.

[Photograph—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a German arabesque (16th century). No. 19,003 in the South Kensington Museum. Dimensions—The same as the Photograph.

[Photograph—Sixpence.]

Class 8.—Painting on Porcelain.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*" Dimensions—The same as the Photograph. This work is to be coloured according to the taste of the painter.

[Photograph—Ninepence.]

(*b.*) *Ornament.*—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528, No. 18,968 in the South Kensington Museum, and coloured according to the taste of the painter. Dimensions—Double the size of the Photograph (linear).

[Photograph—Sixpence.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

Class 9.—Decorative Painting.

(*a.*) *Ornament.*—One prize of £5, and a second prize of £3, for a work, executed after an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum, No. 1,150. Dimensions—length 4ft.—width, enlarged from the print in the same proportion.

[Coloured Print—One Shilling.]

(*b.*) *Ornament.*—One prize of £5, and a second prize of £3, for a work, executed after a *picture frame*, in the South Kensington Museum, No. 7,820. Dimensions—5 feet by 3 feet 11½ inches, outside measure. The works to be executed on canvass, either with or without stretchers, in cool colours. Some lines of the mouldings may be gilt.

[Photograph—One Shilling and Sixpence.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, work executed after a specimen in the possession of the Hon. John Ashley. Dimensions—One-third larger than the lithograph (linear).

[Outline Lithograph—Sixpence.]

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Wyon's* heads of the Queen and Prince Consort, on the Juror's medal of 1851.

(*b.*) *Animal.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Wyon's* "*St. George and the Dragon,*" on the Prince Consort's medal. Dimensions—The same as the casts.

[Casts—Sixpence each.]

Class 12.—Engraving on Glass.

Ornament.—One prize of £10 for the best, and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, A.D. 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the engraving; and if round a glass or goblet, repeated so as not to be less than 9 inches long when stretched out.

[Photograph—Sixpence.]

Class 13.—Wall Mosaics.

Human Head.—One prize of £10 for the best, and a second prize of £7 10s. for the next best, work executed after *Bertini*, of Milan. A preparatory drawing must be made, coloured, after the lithograph, on which the lines and disposition of the tesseræ must be marked. The dimensions of the work should be regulated by the size of the tesseræ proposed to be used, which size may be left to the choice of the artist. Although desirable, it is not necessary to execute the whole subject in actual mosaic, but if a part only be done, the eye must be in such portion. A coloured drawing, with tesseræ, may be seen at the Society's house, and in the South Kensington Museum, and tesseræ of two sizes may be obtained from Messrs. Minton, Stoke-upon-Trent, Messrs. Maw and Co., Brosely, Shropshire, Messrs. Powell and Sons, Temple-street, Whitefriars, and Messrs. Jesse Rust and Co., Carlisle-street, Lambeth.

[Lithographic Outline Coloured—Two Shillings.]

N.B.—A second set of prizes of the same amount is offered to female competitors. See conditions, Section VIII.

Class 14.—Gem Engraving.

(*a.*) *Human Head.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a cameo portrait of Savonarola, No. 7,541 in the South Kensington Museum. Dimensions—The same as the cast.

[Cast—Sixpence.]

(*b.*) *Full-length figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after a small Wedgwood medallion, No. 5,827 in the South Kensington Museum. Dimensions—The same as the cast.

[Cast—Sixpence.]

Class 15.—Die Sinking.

Human Head.—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after the head of the Prince Consort, by *Wyon*, on the Society's medal. Dimensions—Half the size of the original (linear).

[White metal example—Sixpence.]

Class 16.—Glass Blowing.

Ornament.—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work executed after an original in the South Kensington Museum, No. 1,813. Dimensions—As given in the wood engraving.

[Engraving—Sixpence.]

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed in bookbinding, after an Italian specimen in the South Kensington Museum, No. 7,925. The work to be bound should be some classical author of the size given. Dimensions—The same as the photograph.

[Photograph—One Shilling.]

(*b.*) *Leatherwork.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best, work of boiled and cut leatherwork for the outside covering of a jewel casket. Original in the South Kensington Museum, No. 7,768. Dimensions—One-half larger than the photograph (linear).

[Photograph—One Shilling.]

Class 18.—Embroidery.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, work executed, either after a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7,468, which may be adapted to a screen. Dimensions—According to the taste of the embroiderer.

[Photograph—German, Sixpence; Italian, One Shilling.]

CLASS 19.—ILLUMINATIONS.

Ornament.—One prize of £5 for the best, and a second prize of £3 for the next best, copy made from an Altar Card, attributed to Giulio Clovio, in the South Kensington Museum, No. 2,958, or from a MS. border, date 1450, No. 3,057, in the South Kensington Museum. Dimensions—One-half larger than the Photograph (linear).

[Photograph—Two Shillings.]*

SECOND DIVISION.

CLASS 20.—WOOD CARVING.

(*a.*) *Human figure in the round, in alto or in bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

NOTICE.

Any producer will be at liberty to exhibit, either in his own name or through his workmen, any work or works as specimens of good workmanship, in the above-mentioned classes, provided that the work or works be accompanied with a statement of the name or names of the artizans who executed their respective portions; and if the work or works be sufficiently meritorious, extra prizes will be given to the artizans who have executed them.

Artizans may, if they think fit, exhibit works executed by them after other designs than those stated above, in any of the above-mentioned classes. Such works may contain the whole or portions of the prescribed designs, and must be of a similar style and character. Competitors must specify the class in which they exhibit. If the works be sufficiently meritorious extra prizes will be awarded.

All articles for competition must be sent in to the Society's house on or before Saturday, the 22nd of December, 1866, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles, a description for insertion in the catalogue should be sent. The works will be exhibited at the Society's House, and afterwards at the South Kensington Museum. A selection will be made to be sent to the Paris Exhibition of 1867.

(By Order)
P. LE NEVE FOSTER,
Secretary.

April, 1866.

Proceedings of the Society.

TWENTY-FIRST ORDINARY MEETING.

Wednesday, May 2nd, 1866; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Field, James R., 113, 114, and 115, Fore-street, E.C.
Ford, Gerard, 8, Lincoln's-inn-fields, W.C.
Gibbon, Richard, Royal Brewery, Brentford, W.
Lapworth, Alfred George, 9, Canterbury-villas, Maida-hill, W.
Swallow, John Charles, School of Art, York.
Thompson, Reginald Ward, 21, Kensington-square, W.

The following candidates were balloted for, and duly elected members of the Society:—

Fraser, George C., 62, Tredegar-square, Bow, E.
Grist, Richard, Brimscombe, Gloucestershire.
Knatchbull, Wyndham, 3, Chesham-place, S.W.
Silvy, Camille, 38, Porchester-terrace, W.
Spence, Charles Stenson, Shannon-street, Marsh-lane, Leeds.
Tarner, A. Phythian, 3, Upper Baker-street, N.W.
Thorp, Henry, 27, Piccadilly, Manchester.
Ward, John, 13, Donegall-place, Belfast.

The Paper read was—

ON NATIONAL STANDARDS FOR GAS MEASUREMENT AND GAS METERS.

By GEORGE GLOVER, ESQ.

Formerly Lecturer on Natural Philosophy, Royal College of Surgeons, Edinburgh, and Vice President Royal Scottish Society of Arts and Superintending Medical Inspector, General Board of Health, Whitehall.

The subject of gas measurement, which I am about to have the honour of bringing under the notice of the Society, involves the consideration of two kinds of instruments—gasometers and gas meters. The gasometers are of two kinds—the "National Standard Gasholders" deposited at the Exchequer, and those in ordinary use, generally called "testing gasholders." The gas meters are also of two kinds—the wet and the dry.

When, more than half a century ago, coal-gas came into use, the want of a measure for its sale was soon felt. Such a measure was perceived to be indispensable in the event of gas becoming a staple article of commerce. To meet this want, Mr. Samuel Clegg invented the instrument which, from its revolving drum or measuring part being partially submerged in water, has been denominated "The Wet Meter." Ingenious in principle, it was soon found defective in practice. Its principal defect arises from the evaporation of the water causing constant variation in its measuring capacity. The bottom of the measuring chambers is defined by the plane of water in the meter, and the measuring chambers are diminished or enlarged by the accidental quantity of water which may be present at any given instant. The water is continually undergoing change of level from evaporation, which is more or less rapid according to the quantity of gas which passes through the meter, and the change of temperature. The wet meter likewise varies in its measurement with every departure from the true horizontal plane. Inclined forwards, it measures too slow; if backwards, it measures too fast. It also varies with the varying pressure of the gas as it enters the meter. To render a wet meter a fixed measure four things are essential:—

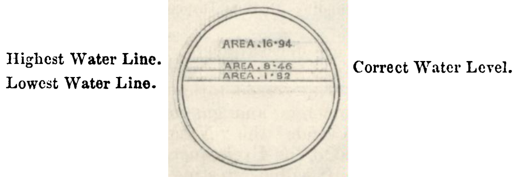
1. That the plane of the water remain fixed:
2. That the bottom of the meter be parallel with the plane of the water:
3. That the meter be placed and maintained on a horizontal plane:
4. That the pressure of the gas as it enters the meter be uniform.

Compliance with these conditions is impracticable, and it is much to be regretted that the baffled ingenuity and futile devices of half a century have not made this conviction general; and that, at the present hour, there should be large towns, such as Liverpool, Birmingham, Sheffield, and several in Scotland, in which gas companies, to their own injury and that of the public, still adhere to the wet meter, notwithstanding its acknowledged defects.

It has been customary, in cases of doubt as to the accuracy of the measurement of gas by wet meters, to lift them from their place, to put them on a horizontal plane, and to adjust the level of the water to a plane of correct measurement. Such a test is no more a proof of a meter's correct performance than a watchmaker's setting a watch to Greenwich time would be an evidence of the watch having gone correctly for the twelve months past, or a guarantee of its accuracy for the twelve months to come. The only correct method of testing the wet meter's performance during any given time it may have been in use, is to examine the internal surfaces of the back and front plates where the water at its various levels has traced or oxidised distinct lines. In a three-light meter, the distance between the two extremes (viz., the highest and lowest water-line) ought not to exceed 3-16ths of an inch, so as to give the variation of 5 per cent. allowed by the "Sales of Gas Act;" whereas, in practice, that distance is found to reach an inch, or even more; thus showing, of course, a proportionate amount of variation in the measuring capacity of the meter. The diagrams (fig. 1) will illustrate this:—

Fig. 1.

Diagrams of Wet Meters, showing the Precise Amount of Variation.



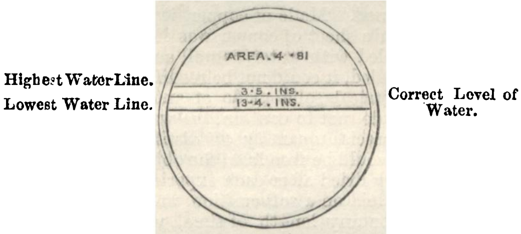
Two-Light Meter.—Scale 1 in. = 1 ft.

Registering 33 per cent. against Consumer.
Do. 7 do. against Company.

sq. ins.
Area of segment down to correct water level, 16·94 + 8·46 = 25·40
Do. to highest do. 16 94

Against Consumer—variation............ 8·46
Then as 25·40 : 8·46 : : 100 : 33·3 per cent.
Area of segment down to lowest water level.......... .... 27·22
Do. to correct do. .... 25·40

Against Company—variation .... 1·82
Then as 25·40 : 1·82 : : 100 : 7·16 per cent.



Five-Light Meter.—Scale 1 in. = 1 ft.

Registering 9 per cent. against Consumer.
Do. 29 do. against Company.
Area of segment down to correct water level = 45·31
Do. to highest do. = 41·81

Against Consumer—variation ...... 3·5
Then as 45·31 : 3·5 : : 100 : 8·96 per cent.
Area of segment down to lowest water level ... 58·71
Do. to correct do. ... 45·31

13·4
Then as 45·31 : 13·4 : : 100 : 29·49 per cent.

There has been no lack of effort to remove this defect in the wet meter. Ingenuity, labour, and vast sums of money, have been lavished upon it. The Patent Office, year after year, has been besieged by inventors who imagined they had discovered a remedy; but, for all practical purposes, there has been little, if any, improvement on the original invention.

The inventions which have aimed at preserving a fixed water-line may be reduced to three classes:—Those having a reservoir or small cistern in connexion with the meter, and a tube communicating with the surface of the water in the meter, on the principle of a bird-fountain; those in which a spoon or bent tube on the axle lifts a small quantity of water in each revolution by dipping into a cistern or water-box; those which float the drum itself, or have a float nicely balanced, of semicylindrical or hemispherical form, turning on a horizontal axle mounted near the level of the water in the meter. Many of those inventions have, from time to time, obtained partial success. Some of them have been revived, again and again, under different names, and with slight modifications, but all of them have ended in failure and disappointment. The method of floating the drum Mr. Clegg invented shortly before his death. The simplicity and theoretical beauty of the invention are apparent; and, could the sides of the revolving drum be kept vertical to the plane of water, the drum itself perfectly balanced and free from deposit; could the water be kept pure, the pressure of the gas free from variation, and the moving parts from corrosion, it might be hoped that one serious practical objection to the wet meter had been removed. These conditions, however, all experience has shown cannot be realised.

Vigorous efforts are being made to revive the use of a meter, constructed on the same principle of floatation, which was patented by Messrs. Sanders and Donovan in 1855. Theirs is the simplest and most scientific invention yet propounded for preserving the uniform level in the water-line. Its ingenuity reflects high credit on the inventors. But, without unfairly detracting from this, it may be stated that their invention has increased both the size and complexity of the instrument; that its extreme delicacy and the complication of its parts, while multiplying the chances of error in its workmanship, expose it to quicker decay; and hence repair and replacement are necessarily more frequent. Its delicacy, in fact, unfits it for everyday use, and makes it very liable to derangement. The water in the meter becomes impure and even tarry; impurities, from time to time, are deposited on the float; its balance is impaired; its axle and the float corrode; small holes are formed in it by corrosion through which the water enters, when it ceases to be a float,—so that it not only fails to adjust the level of the water, but becomes more defective than the ordinary wet meter.

It is open, besides, to the very serious objection that, by unscrewing the lower plug, as much gas can be got as from the outlet of the meter itself, a circumstance which offers a strong temptation to fraud.

The variation in measurement is, of course, the grand objection to the wet meter. It is not the only one, however. Though fatal in itself, there are others I may just mention. There is the annoyance from the unsteadiness of the lights, familiarly called "jumping." There is the danger of sudden extinction. There is the danger of escapes of gas through the meter being interfered with, as when the plugs are removed that the water may be replenished, and, through carelessness, not replaced. There is the facility with which the measurement in the same wet meter can be made to vary, either from the quantity of water put into the meter, the inclination given to it, or from both, and the consequent temptation to fraud. There is the necessity of placing it in the basement of the house, and the consequent attempt to prevent the "jumping" of the lights by giving all the pipes a gradual rise from the meter to admit of the water trickling back into it, an attempt at once futile, expensive, and injurious to house property. Its very situation in obscure out-of-the-way corners is apt to create a suspicion in the mind of the consumer that he is wronged in his measurement, while the gas companies are made dependent on the vigilance of their inspectors to an extent undesirable alike for the employer and the employed. The defects of the wet meter too often expose the managers and directors of gas companies to unjust suspicions, while really the companies are the greatest losers by it, and the parties most deeply interested in the just measurement of gas. When the meter is found not to have registered at all, or to have registered only a small portion of the gas passed through it, it is not unusual to ask the consumer to pay for his gas without any reference to the meter, but to his payment for the corresponding quarter of the previous year, a mode of adjustment unsatisfactory both to the seller and the buyer.

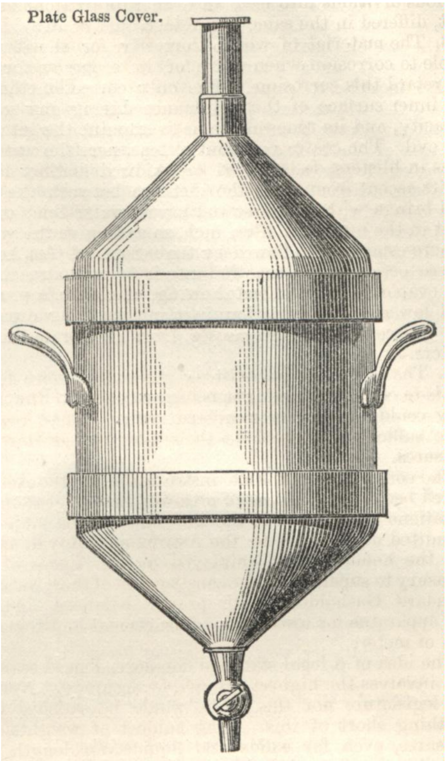
The interests of the public and the gas companies alike demanded that the evils of a system of measurement which involved variations reaching sometimes as high as 20 and 30 per cent. should be fairly met. "Why," it was asked, "should not gas be justly measured as other staple commodities are measured? Why should not the consumer have a guarantee that he really gets the quantity he pays for, and the producer that he really gets payment for the quantity he delivers? If security be given for the just measurement of a gallon of oil and a pound of candles, it is not less necessary for a cubic foot of gas." From evidence given before Parliamentary Committees, it appeared that, owing to the want of a legal criterion and inspection, what was called a cubic foot differed, when measured by the meters of one manufacturer as compared with those of another, as much as 3 per cent., and that, when the meters were in the most perfect working condition. The prevailing dissatisfaction and the antagonism, prejudicial alike to the gas companies and the public, to which this state of things gave rise, at length drew the attention of the Legislature to the subject. The result was the bill presented by Lord Redesdale, to the House of Lords, in the first session of 1859, for the purpose of establishing a standard cubic foot for gas measurement, and extending the general law of inspection of weights and measures to gas meters, with such other provisions as the special nature of the subject seemed to require.

The "Sales of Gas Act" introduced by his Lordship received the sanction of the Legislature in the session of 1859. The principal provisions of that Act are sufficiently well known. It fixed, for the first time, as the "only legal standard or unit of measure for the sale of gas by meter, the cubic foot, containing 62·321 pounds avoirdupois weight of distilled or rain water weighed in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at thirty inches." And had the Act done no more than this it had conferred an important boon on the gas companies and on the community at large. A first and important step was then taken in the right direction.

The duty, of providing standard measures for gas, was devolved by the Act on the Lords Commissioners of Her Majesty's Treasury. The Astronomer Royal's familiarity with the subjects of the standards of weights and measures specially qualified him for such a duty, and his services to the Exchequer in connection with this subject having been acknowledged as of high value, their Lordships applied to him to assist them in providing the requisite instruments. The public and the gas companies were entitled to expect that the services of a philosopher so distinguished, in the application of the exact sciences, should be made available to attain, in the standard measure for gas, as much accuracy as possible.

Acting under the authority of the Lords Commissioners, and aided by Professor Miller, of Cambridge, the Astronomer Royal provided a bottle for measuring the cubic foot defined in section ii. of the Act. In his report to their Lordships of the 11th Feb., 1860, he says, "Acting under the authority given by your letters of October 14th and 15th, 1859, and having secured the valuable assistance of Professor W. H. Miller, I caused to be prepared a weight of 62·321 pounds, constructed of hard gun-metal, and a metallic vessel or bottle, intended to contain one cubic foot, constructed of thin copper, in shape a cylinder, with a cone at each end; the upper cone having a small cylindrical neck for the introduction of water, and the lower one having a tap for its discharge." Whether the bottle (fig. 2.), so described, was the best instrument for the purpose may, I think, be fairly questioned. Made of copper, it was liable to corrode. The thin sheet of copper was liable to change of form when filled with water, as well as from external injury. Once filled, it could not be readily dried. I submit that a geometrical solid made of anti-corrosive metal, made to exclude, not to contain, the water, and losing in weight the precise quantity of distilled water defined in clause ii., would be free from the objections stated, and could be easily dried after each experiment. It could be preserved, if laid on a soft cushion, under a glass, at the Exchequer, for any length of time, without change or diminution.

Fig. 2.



Cubic Foot Bottle.

Scale ⅛ full size.

Having obtained a bottle fitted to contain the "unit of measure" required by section ii. of the Act, the Astronomer Royal's next step was to apply it in accordance with section iii., which requires that, "within three months next after the passing of the Act, models of gas-holders measuring the said cubic foot, and such multiples and decimal parts of the said cubic foot as the Lord High Treasurer or the Commissioners of Her Majesty's Treasury shall judge expedient, shall be carefully made, with proper balances, indices, and apparatus for testing the measurement and registration of meters, and such models shall be verified under the direction of the Lord High Treasurer or the said Commissioners, and, when so made and verified, shall be deposited in the office of the Comptroller-General of the Exchequer at Westminster."

In carrying this enactment into effect, it was found that none of the gas-holders hitherto in use for testing meters could be adopted as a standard measure. The more prominent objections to them were these:—

1. Their measuring part was not truly cylindrical.

2. No two gas-holders agreed in measurement. Not only did they differ from each other to the extent of 3 or 4 per cent. in their measuring capacity, but the various divisions into feet, and the sub-divisions of the feet, differed in the same gas-holder.

3. The material of which they were made was very liable to corrosion when in contact with gas and water. To retard this corrosion paint was used. The paint in the inner surface of the bell diminishes its measuring capacity, and its renewal from time to time aggravates the evil. The coating of paint softens, swells, frequently rises in blisters, falls off in flakes, or crumbles away. In its ascent from the cistern, the painted surface of the bell brings with it a quantity of water, which adheres to it in the form of a film, and numerous drops which adhere especially to the inner surface of the flat cover. These occasion further diminution of capacity, whilst the evaporation of the water on the outer surface of the bell lowers the temperature, diminishes the volume of the gas contained, and causes error in the testing of meters.

4. The scales of the existing gasholders were found liable to corrosion, and, not being attached to the bell, they could be readily tampered with. These reasons were sufficient to preclude their adoption as standard measures.

The construction of such instruments as the Act required becoming daily more pressing, and urgent representations being made to the Treasury on the subject, I submitted my designs to the Astronomer Royal, and I had the honour to be employed by the Lords of the Treasury to superintend the construction of the "National Standard Gasholders, with proper balances, indices, and apparatus for testing the measurement and registration of meters."

The idea of a legal standard measure, I need scarcely say, involves the highest attainable accuracy. Neither the legislature nor the public would be satisfied with anything short of this. The subject of weights and measures, even for solids and liquids, for length and capacity, is one of much practical difficulty. The records of the Royal Society abundantly testify how much time, labour, and thought have been given to the solution of these apparently simple questions—"What is a pound weight?" "What is a yard?" Not to travel back into the remote past, I need only remind you of what happened when the Houses of Parliament were destroyed by fire in 1835, and the yard measure perished with them. A Royal Commission was appointed to restore it. After deliberating some twelve years they could find nothing fixed, either in time or space, to which to appeal for a standard measure. Neither the seconds pendulum nor the arc of the meridian of the French philosophers could be appealed to; and they had no alternative but arbitrarily to decide that the rod they had deposited at the Exchequer was a yard. But in constructing a standard measure for gas, the difficulties are much more complicated. The body to be measured is an aëriform body, invisible, highly elastic, varying in volume with every barometric change, very complex in its chemical constitution, affected by every change of temperature, liable to condensation, and to be absorbed by water, of which it is also an absorbent.

The National Standard Gasholders were made at the works of Messrs. Bryan Donkin and Co., whose well-known accuracy in workmanship and perfect machinery for drawing truly cylindrical tubes of large size, recommended them for such an undertaking. They were constructed under my direction and constant superintendence. In constructing the instruments, the various properties of gas, I have just named, had to be taken into account, and the following conditions were laid down as essential:—

1. That they should be composed of a non-corrodible metal capable of resisting the chemical action of the constituents of coal gas and water.

2. That the surface of the bell should readily part with water.

3. That the bell, or measuring part of the instrument, should be a truly cylindrical vessel and sufficiently rigid to resist change of form from the application of any ordinary forces.

4. That it should have a correct scale engraved upon it to indicate its capacity in cubic feet, and the subdivisions of the feet into minute fractional parts.

5. That it should be correctly balanced, and that a part of the counterpoise, suspended by a cord passing over a spiral, should preserve its equipoise at various depths of its immersion in the water in the cistern.

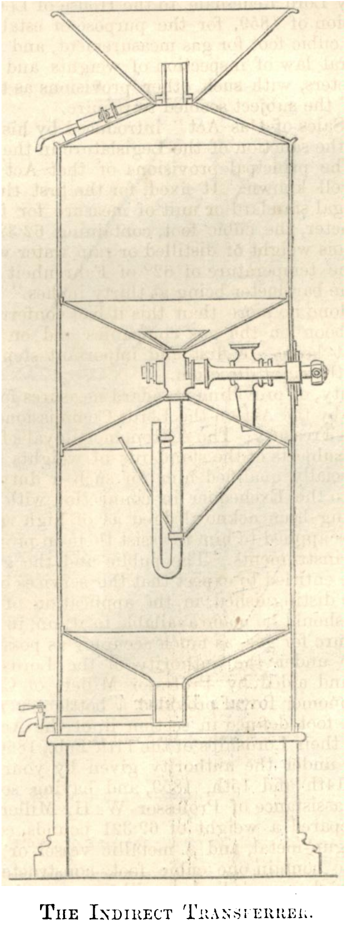
6. That the sides of the bell should be maintained vertical in its ascent and descent.

7. That the taps should be lined with the anti-corrosive alloy, and the density of their rubbing surfaces be so varied as to reduce their friction to a minimum, and secure their durability and soundness.

8. That the different parts of the instrument should be so perfectly adapted to each other, that when put together as a whole, it should work easily, steadily, and correctly.

The standards having been constructed, the next point of difficulty was the application of the cubic foot bottle in graduating them. Their graduation involved nice scientific considerations, and a series of experiments requiring much delicacy and care. I may here state that in the graduation and experimental adjustment of the

Fig. 3.



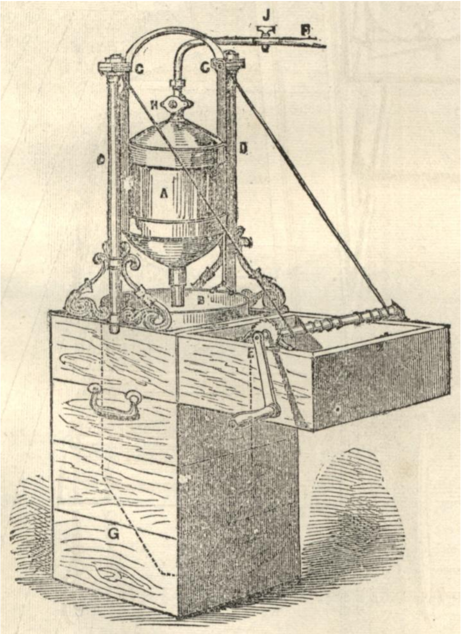
The Indirect Transferrer.

standard gas-holders I received most valuable assistance from Mr. William Græme Tomkins, C.E., who was afterwards employed at the Exchequer in the application of the standards in the verification of the gas-holders for testing meters furnished to the local authorities, and in this his engineering knowledge and experience in the manufacture and use of instruments of precision was of great service. Though the cubic foot bottle already described was accurately adjusted for containing the "legal standard and unit of measure," there was no method known by which it could be used in measuring gas, or in the graduation of holders. An instrument called a "transferrer," of which I give a diagram (fig. 3), was resorted to. It consisted of "an upper chamber containing exactly the volume of one cubic foot, and adapted, with proper arrangement of cocks and pipes, by repeated discharges of the water filling the upper chamber into the lower chamber, to discharge in succession any number of volumes of air, each of one cubic foot, into any vessel properly prepared for their reception." This instrument was resorted to without any satisfactory result. It was open to serious objections. The filling of the bottle produced agitation of the water, displacing air from the water, and entangling variable quantities of it in minute bubbles, many of which adhered to the inner surface of the bottle. Every means which suggested itself was tried to make it available, but these giving no satisfactory result, it was laid aside. Analogous methods were tried of transferring the exact cubic foot of air to the gasholder, but with hardly more success. A closer approximation in some instances was obtained, but the uniformity was not such as to justify their adoption in the division of the scale. At last it occurred to me that, instead of using the bottle indirectly, it might be used directly, the second vessel being dispensed with. The diagram (fig. 4) will explain the process.

1. The bottle was inverted.
2. The plug was drawn out.
3. The openings caused by the withdrawal of the plug were closed with glass.
4. A piece of leaden tube was soldered to the end of the tap.
5. This tube was connected with the gasholder to be tested.
6. A cistern containing distilled water was placed below the bottle thus secured in a fixed vertical position.
7. The cistern was raised steadily, without the water being agitated, through the entire length of the bottle, until the water reached the point where the plug of the tap, had it been retained, would have stopped it, and the entire volume of air, viz., one cubic foot, defined by the contents of this bottle, was found to have been transferred to the gas holder.

By this method, simple and direct, the various errors occasioned by the complicated character of the "indirect transferrer" are at once avoided. Tested by numerous experiments, the results of this method have been invariably satisfactory, and it has removed a difficulty long felt by meter makers in the graduation of their holders for testing meters. In his letter to the Lords Commissioners, from which I have already quoted, the Astronomer-Royal, referring to it, says, "The volume of air defined by the contents of the cubic foot bottle was forced into the gas-measurer (fig. 5) under trial by a process invented and introduced by Mr. George Glover, in which the nearly undisturbed surface of water is carried gradually through the entire length of the bottle without risk either of absorbing or giving out air. For the one-foot gas-measurer this operation, in strictness, was required only once (but, as a cautionary step, it was repeated several times). For the 10-feet gas-measurer it was necessarily to be done ten times. The result of the examination was that the 5-feet measurer exhibited no trace of error; that the 10-feet measurer appeared to show an error of about $\frac{1}{3000}$ part, which appeared to be undoubtedly due to a little change of temperature; and that the 1-foot measurer, which is extremely sensitive to such changes, apparently exhibited errors, sometime $+\frac{1}{500}$, sometimes $-\frac{1}{500}$. Regarding these indications as merely illusory, I do not doubt that the gas-measurers are as accurate as it is possible for human skill to make them, and I therefore report them as being, to all intents and purposes, perfect."

Fig. 4.



Geo. Glover's Direct Transferrer.

Scale $\frac{1}{10}$ inch = 1 ft.

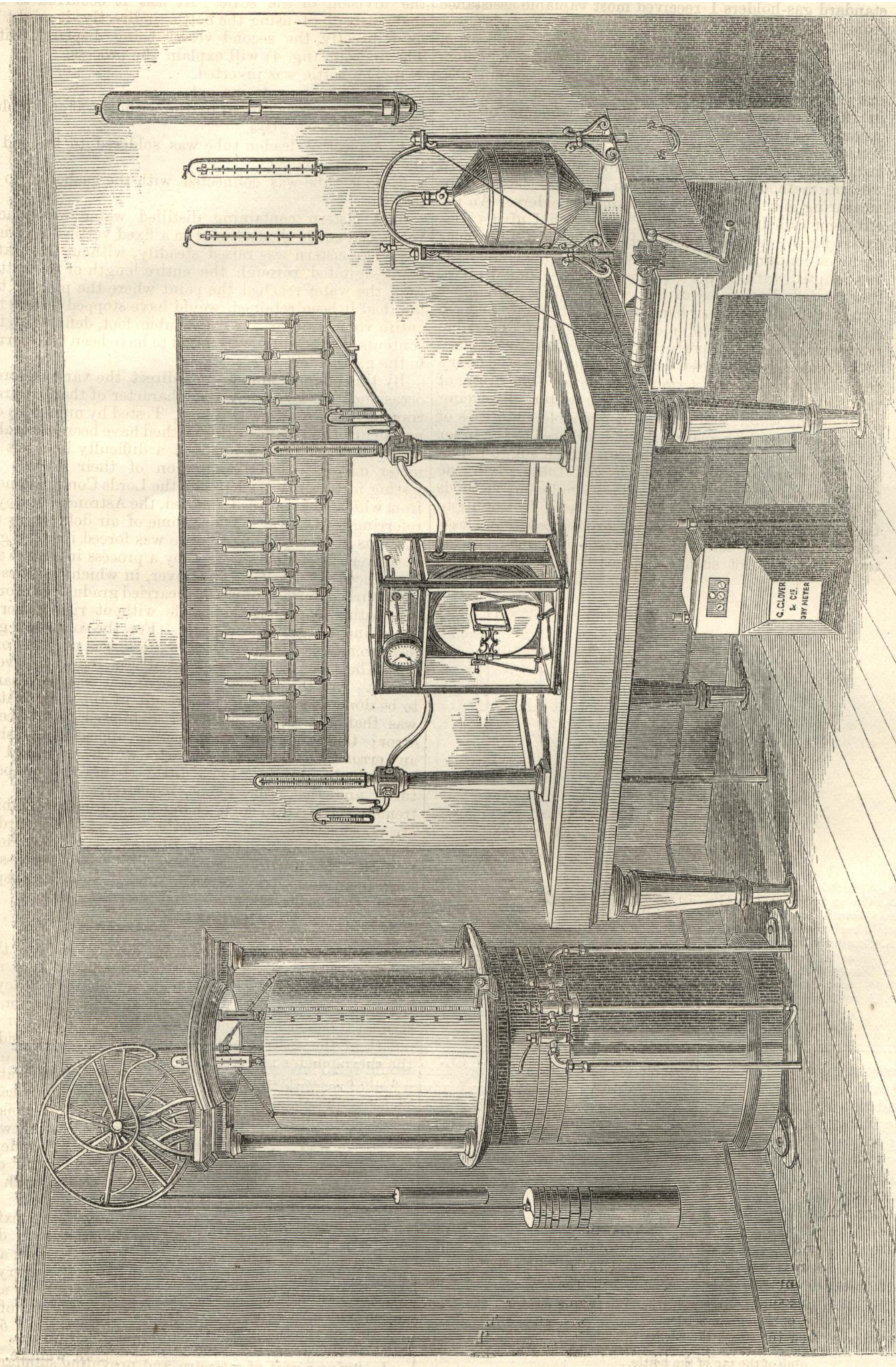
A. Inverted cubic foot bottle.
B. Cistern to be raised.
C C. Small pulleys for rope connecting windlass with cistern.
D D. Pillars to support cubic foot bottle, and to which the pulleys are fixed.
E. Windlass with ratch for raising the tank or cistern.
F. The exit pipe from bottle.
G. The box in which the whole instrument is enclosed.
H. Window covering the aperture made by the withdrawal of the plug of the tap of the bottle.
I. Tap betwixt bottle and holder.

The experience of five years, I am happy to say, has only confirmed this testimony.

In verifying holders, and in testing meters, thermometers of a peculiar construction (fig. 6) are used with elongated bulbs, by which sufficient delicacy of indication is insured, whether of the testing-room, the standard bell, the outlet of the standard bell, or the outlet of the instrument being tested. On one side of the thermometer is a scale for temperature, on the other a scale for corrections rendered necessary by variations of temperature and moisture in the gas. The scale is calculated from the tables for temperature and moisture kept at Greenwich Observatory during a period of twelve years; and Mr. Glaisher kindly assisted in rendering the instruments more perfect, and in carefully comparing them, throughout the whole scales, with the standard thermometer at the Observatory.

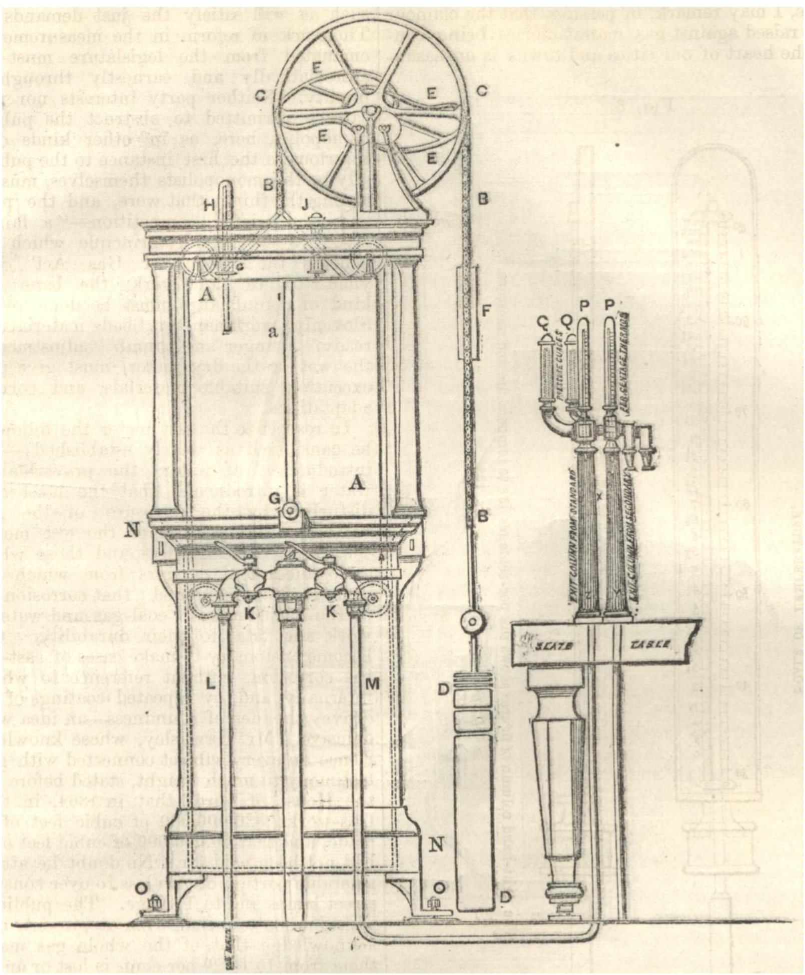
Thermometers in general use vary to a large extent, not only from each other, but from themselves, in different parts of the scale. Gas, as you know, expands about $\frac{1}{4}$ per cent. from temperature and moisture for every degree of Fahrenheit's scale, *i.e.*, in round numbers, about 5 per cent for twenty degrees. Gas coming out of the ground at the temperature of 40° would increase 5 per cent. in this room if the temperature were 60°.

In fixing a unit of measure, and providing standards of



GEORGE CLOVER'S PATENT STANDARD GASOMETER, METER, AND DIRECT TRANSFERER.

Fig. 5.



Geo. Glover's Standard Gas Holder.

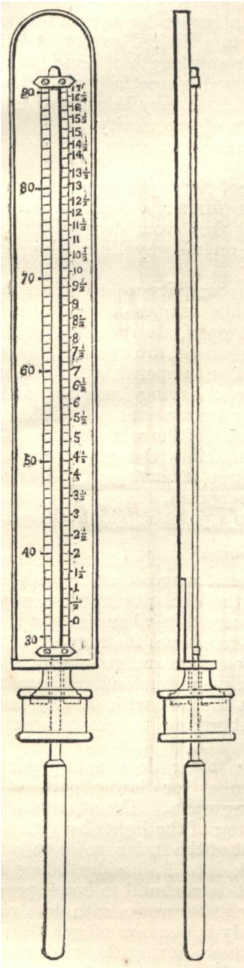
A A. Inverted cylindrical vessel, commonly called the bell.
a. The scale engraved on the bell.
B B. Chain or band by which the bell is hung.
C C. Wheel or pulley over which the chain or band works.
D D. Counterbalance weight for the bell: upper parts movable, so as to give the two pressures required by clause 13 of the Act.
E E. The cycloids or spirals fixed on the pulley shaft, and balancing each other.
F. A counterbalance weight attached to the extremity of one of the cycloids to maintain the true balance of the bell at varying depths of the water.
G. Microscope for reading the scale.
H. Thermometer on the bell.
J. Pressure-gauge on the bell.
K K. Taps.
L. Inlet pipe.
M. Outlet pipe.
N N. Cistern or tank.
O O. Adjusting screws for levelling cistern.
P P. Thermometers on testing table.
Q Q. Pressure gauges on table.

measure of the highest attainable accuracy, the "Sales of Gas Act" has rendered a great and valuable service. And here I am reminded of the language employed by the famous Laplace, when speaking of national standards for weights and measures generally:—"We cannot reflect on the prodigious number of measures in use, not only among different nations, but even in the same country, their capricious and inconvenient divisions, the difficulties of determining and comparing them, the embarrassments and frauds they occasion in commerce, without regarding, as one of the greatest benefits, the improvements of science and the ordinances of civil government can render to mankind, the adoption of a system of measures, of which the divisions being uniform, may be easily derived in calculations, and which may be derived in a manner the least arbitrary from the fundamental magnitude indicated by itself. A nation that would introduce such a system would unite to the advantage of reaping the first fruits of the improvement, the pleasure of seeing its example followed by other countries, of which it would thus become the benefactor."

And so, in the present instance, we are already reaping the fruits of the "Sales of Gas Act." A great advance towards correct measurement has been effected. The inaccuracy of the meters in general use hitherto has been fully established. The companies and the community can now be protected. So far the legislature has done its duty. Lord Redesdale's Act carried legislation as far as the present state of our information justified; and it avoided the grave error of going beyond it. The prudent and wise course for government to pursue is clear. It is at once its duty and its interest to protect, encourage, and give every facility to a manufacture now so intimately connected as gas is with the public welfare.

And here, I may remark, in passing, that the clamour now being raised against gas manufactories being conducted in the heart of our cities and towns is unreasonable. It has gained strength from the recent explosion of a gas-holder not far off,—a circumstance which has excited needless apprehensions. No occurrence could be more exceptional. I believe it is without precedent; and it arose from a circumstance which might easily have been prevented. When, in 1854-55, I had the honour to be instructed by Sir Benjamin Hall (now Lord Llanover) to examine and report on the gas works of the metropolis, for his guidance, with reference to the "Nuisances Removal Act," I reported that gas works could be conducted in populous neighbourhoods without being a nuisance or injuring the public health. Legally to constitute a nuisance three things must be established:—a noxious element in sufficient quantity; that element in sufficient intensity and in continuous action; and gas-works were not declared such a nuisance. To science, in fact, and not to legislation, must the public look for the removal or mitigation of any evil or danger which they may occasion.

Fig. 6.



Scale of Temperature.

The right-hand column of figures shows the per-centages due to temperature and moisture.

But, to return; the government having done its duty, it should be the endeavour, as it is the interest, of meter manufacturers to produce meters such as will satisfy the just demands of the public. The work of reform in the measurement of gas which emanated from the legislature must be carried on systematically and earnestly throughout the community. Neither party interests nor party prejudices can be permitted to obstruct the public weal. Old monopolies here, as in other kinds of manufacture, injurious in the first instance to the public, and eventually to the monopolists themselves, must be considered among the things that were, and the principle of free and unrestricted competition—"a fair field and no favour,"—as the only principle which can secure the benefits the "Sales of Gas Act" was meant to yield. Mere slop work, the bane of every other kind of manufacture, must be done away with in this. Slovenly workmanship, bad materials, "rough and ready," "finger and thumb" adjustment, whether of the wet or the dry meter, must give place to careful execution, suitable materials, and correct mechanical adaptations.

In respect to the wet meter the following points may be considered as clearly established:—That, with the introduction of water, the proverbial instability of water is introduced; that the level of the water is disturbed by the pressure of the gas constantly varying; that the use of the wet meter exposes the companies to severe loss, and those who use them to annoyances and dangers from which dry meters are comparatively exempted; that corrosion from the action of the constituents of coal-gas and water is actively at work and fatal to their durability. Of late it has become customary to make cases of cast-iron, to conceal the corrosion, without reference to what is going on internally, and, by repeated coatings of green paint, to convey the idea of soundness—an idea which is simply delusive. Mr. Hawksley, whose knowledge and experience on every subject connected with gas entitles his testimony to much weight, stated before a Committee of the House of Lords that, in 1864, in the Nottingham Gas-works, 330,000,000 of cubic feet of gas had been made, and that 50,000,000 of cubic feet of that quantity had not been paid for. No doubt he attributed a considerable portion of this loss to over consumption in the street lamps and to leakage. The public will be astonished when told that, even at present, most companies acknowledge that of the whole gas manufactured by them from 15 to 20 per cent. is lost or unpaid for; a loss which is usually ascribed to leakage. Most gas companies, as a rule, have no correct method of ascertaining the exact amount of loss; but, whenever the question is carefully gone into, and accurate methods of measurement applied, the loss out of profits is found to be from 20 to 25 per cent., and, in some instances, even more. About 15 per cent. of this loss may fairly be put down to defective meters. The tenacity with which many companies have clung to the wet meter, and their efforts to maintain it, have been in no small measure owing to the want of a suitable substitute, and the failures which, with one exception, have marked the history of the dry meter manufacture. These failures may be traced to one or other of the following sources:—The inadequate scientific knowledge of the manufacturers themselves; the complexity of the conditions the manufacture involves; the error of adopting angular movements in the measuring chambers instead of direct action: the use of rotary valves; the difficulty of arriving at the combination of metals in such definite ratios as to constitute a true alloy, the uniform density and structure of which shall be such that, when manufactured into a D slide valve, the rubbing surfaces shall wear equally, and the perfect soundness of the valve shall be maintained.

The dry gas meter has been brought to its present condition of excellence by successive stages. The essential improvements, invented by Mr. William Richards, and patented by Messrs. Croll and Richards in 1844, consisted in the introduction of the diaphragm and the direct action of the disc. The theoretical accuracy of the principles, which the invention of Mr. Richards involved, time and experience have fully established. The patentees, however, failed to reduce those principles to practice in producing a good and durable instrument, and they abandoned its manufacture. Mr. Croll having secured the patent, Mr. Thomas Glover, in 1845, commenced the manufacture of the meter, as Croll and Glover's patent dry gas meter, and ultimately he manufactured it as his own, having from time to time introduced such improvements on the meter as experience pointed out to be necessary to render it a reliable gas-meter. To him belongs the merit of having imparted to Mr. Richards' invention a real and practical value by the production of a correct and durable instrument.

And here I may be allowed to refer to certain improvements made in the dry gas meter by myself. The meter of Messrs. George Glover and Co. has a large and distinct dial, which shows at a glance the number of cubic feet of gas passed; the number of the meter's capacity per hour and per revolution, and the marks of identity, all of which the "Sales of Gas Act" requires, the maker's name, and the date of the manufacture. These points of information are inscribed on an enamelled dial in legible and indelible characters; and they are necessary for reference, especially when disputes arise between buyer and seller, in which case the marks of identity and capacity are essential. These should not be entrusted to flimsy badges of thin metallic substances, which become tarnished and illegible, accidentally fall off, and can easily be transposed for fraudulent purposes.

A slot is introduced in our manufacture, and a pin which connects the valve and valve rod. This facilitates the adjustment of the two sets of valves necessary to the uniform flow of gas, without which steady lights cannot be obtained. The attempt to adjust the position of the valve pin by giving a curvature to the valve arm is very objectionable. The valve arm has to be made soft, so as to admit of this finger and thumb adjustment, its protracted immersion in gas rendering it still softer. The result is that the rod becomes more or less curved during the action of the meter as it transmits force, in the direction of its length, as a thrust or as a pull alternately.

Another improvement I have effected is the introduction of a slot in the tangent of the meter, and the placing a shoulder or rest on the tangent pin, the flat surface of which rests on the upper surface of the tangent. The pin is secured in its place by a screw from below, the flattened head of which fixes it firmly at any desired point of the slot. This arrangement keeps the pin in a perfectly vertical position, and admits of the meter being registered with care and precision. To secure uniformity we stamp the cases and internal parts of our meters. This we do by steam power, and we are thereby enabled to effect a saving in their production.

To reduce to practice the idea of a machine for the accurate measurement and correct registration of gas the experience of half a century has shown to be no easy problem. The construction of a good and durable dry gas meter involves a multiplicity of chemical and mechanical considerations, to each of which its due weight must be assigned.

As I said, when speaking of the standards, a subtle, invisible, elastic, aëriform body, very complex in its chemical constitution, susceptible of change in condition and volume from slight variations in temperature and pressure, has to be accurately measured, and the result of that measurement must be accurately recorded. The instrument must be self-acting, and must act in a closed chamber, continuously or at intervals, requiring no adjustment or interference of any kind. All its parts which come in contact with gas must be made of anti-corrosive metal; while the materials, forms, and combinations of its different parts must be so arranged and so adapted to each other that, when put together as a whole, it shall work easily, steadily, and correctly.

Many have a strong prejudice against using leather in dry gas meters. This prejudice is well-founded when the leather is not properly prepared for gas, or when it is used as a hinge for the doors of the measuring chambers in meters of oblique action, when it is liable to give way. But when it is properly prepared for the reception of gas, which contains carbolic acid or creosote—an excellent antiseptic for animal texture—and its flexibility is used to a limited extent, it will remain sound and pliable for any length of time. The dry gas meter, in fact, obviates, I respectfully submit, all the objections to the wet meter. I may be allowed to state *seriatim* its different points of superiority.

1. It measures accurately, and does not vary in its registration.

2. It does not cause jumping, or sudden extinction of the lights, the former a common source of annoyance, the latter not free from danger, especially in large assemblies, and on railway lines where signal lights are used.

3. It does not require to be opened that water may be put into it; thus escapes of gas from the plugs being carelessly left open, always offensive, and occasionally producing explosions, are averted.

4. It cannot be tampered with without showing distinct evidence of having been so; and it is thus free from the many temptations and facilities to fraud which are characteristic of the wet meter.

5. It does not allow the gas to pass without being registered, a source of much greater loss to companies than is commonly supposed, and which is caused by the water level falling to a point at which the gas passes unregistered.

6. The frequent supply of water now rendered necessary by the small range of error allowed by the "Sales of Gas Act," the vigilant attention required to prevent fraud, and to ascertain when the gas is passing unregistered, need three times the number of inspectors requisite where dry meters are used; whilst in testing meters the expense of inspectors and instruments is three times as great with the wet with the dry meter, which thus effects a great saving to gas companies and to local authorities.

7. The dry meter does not require to be placed in the basement or lower part of the house, but may be put anywhere. The attempt with wet meters to prevent jumping of the lights by giving all the pipes a gradual ascent of the meter, so as to admit of the water trickling back into it, besides being impracticable, is expensive and detrimental to house property.

8. The dry meter works with less pressure than the wet. Not only is a saving of gas thus effected, but in large cities where, during the winter season, dense fogs occur, the low pressure in the mains during the day is not adequate to move the wet meters so as to supply enough of gas for the burners, and only small smoky flames can be obtained from them, but with the dry meter under all these circumstances there is sufficiency of light. Thus interruptions to business are averted.

9. The action of the dry meter cannot, like that of the wet, be arrested by frost, causing total extinction of the lights. This makes the dry meter especially advantageous on railway lines, precluding, as it does, the necessity of keeping up fires near the meter during a severe and protracted frost. This applies with peculiar force to countries where the cold is intense, and where the evil is attempted to be combated by putting spirits or glycerine into the meter.

10. Made of anti-corrosive metal, and not subject to the corrosive power of the chemical constituents of coal gas and water, the dry meter is a much more durable durable instrument than the wet.

Coal gas, like water, has become a necessary of life. It is so, more especially in large towns. Its superiority over all other materials for producing light is acknowledged, and the general and persistent demand of the public for gas at a lower price, and of higher illuminating power, has induced gas companies again and again to lower its price; some to a point at which it is vain to expect profit so long as a loose system of measurement prevails, and one-fourth or one-fifth part of the whole quantity produced is allowed to go to waste, and is not paid for. Coal is becoming dearer; labour more expensive. And the question arises—How are dividends to be maintained or improved and the enormous capital sunk in gas properly protected? The coal cannot be made to produce more gas. Improvements and economy in its manufacture and distribution have nearly reached their limit. The pipes now are more solid than they used to be, while their increased size has enabled the companies to distribute their gas at a lower pressure. The joints, services, and fittings have been rendered much sounder and more perfect, so that, in gas-works which are properly managed, the actual loss by leakage is probably less than five per cent. And it is daily becoming more apparent that, if gas is to be produced at a remunerative rate, the present loose system of measurement must cease, and imperfect meters must give place to others which are reliable.

DISCUSSION.

Mr. Alex. McIvor said they were all indebted to Mr. Glover for his able paper, and he had no doubt scientific men would admit that he had done them service, as well as the proprietors and managers of gas works, in drawing attention to the subject of gas measurement. It had hitherto been a matter of great difficulty to find the means of accurately measuring gas, and this was only to be arrived at by the most delicate and carefully constructed apparatus. It must be admitted that great success had attended Mr. Glover's labours, for he had given a degree of accuracy and precision to the art of gas measuring which was previously unknown. The gasometers previously in use for testing meters were most imperfect and unsatisfactory, and presented a great many difficulties to gas managers. He had been shown by one manager a gasometer which he employed for this purpose, consisting simply of a bell suspended by a string over a pulley. It was painted green, and when pulled out of the water it was covered with wet. It was unnecessary to point out how imperfect such a measuring instrument as that must be. It was to be regretted that many gas managers were but slightly acquainted with the nature of the process they carried on. Until they got suitable instruments, however, it could in no case be expected that they would do the work properly. The perfection to which the art of gas making and distribution was now brought reflected great credit on the country, and the importance of the manufacture might be estimated by the fact that the consumption of gas in this kingdom amounted to £6,000,000 sterling annually.

Mr. Chaney said, as an officer of the Exchequer, he begged to thank Mr. Glover for his valuable paper; he wished at the same time to remind the meeting how much they were indebted to Professor Airey, whose name had been so prominently mentioned in the paper, for his labours on this subject. He had devoted much of his valuable time, for a period of thirty years, to the restoration and preservation of our standard weights and measures. They were also indebted to Mr. George Lowe, a famous gas engineer, for the introduction of the decimal system in gas measurement; and to Dr. Frankland, for his valuable investigations into the chemical and physical constitution of gas.

Mr. E. H. Thorman regretted that no manufacturer of wet meters had risen in their defence. He could not quite agree with the sweeping condemnation that had been passed upon those instruments. It was a long time before he became a convert to dry meters. He knew that the public would now, if possible, have dry meters, but he thought the complaints against wet meters were more than experience and practice justified. He believed that the bad cases of error that had been brought forward were quite exceptional, and he regarded the wet meter as being very beautiful in its mechanical operation, and in every way worthy of the support of the gas companies.

Mr. C. F. T. Young considered that the defects of the wet meter had not been dwelt upon too strongly, as they immediately became manifest on inspecting one which had been a long time in use. There was a constant antagonism going on between the materials—iron and brass—of which the mechanical portion of the instrument was formed, and the water in which it worked, and destruction of the parts necessarily ensued. When they reflected upon the fact that so small a difference of level in the water as a quarter of an inch very materially affected the discharge of the gas from the meter, it would be seen how important it was, both to the consumer and the manufacturer, that an instrument not liable to such imperfections should be employed. He had heard it asserted by persons well informed on the subject that wet meters had even been found to register incorrectly to the extent of 60 per cent. In the cases of 36 meters, taken indiscriminately, the register was found to be invariably incorrect, being in some cases against the consumer, and in others against the gas company. The dry meter certainly removed many of the objections which attached to the wet meter, and which were inherent to the principle on which it was constructed, and in his opinion the former was certainly much to be preferred.

Mr. F. W. Hartley said he stood there as an impartial individual, inasmuch as he was interested in the manufacture both of wet and dry meters. He admitted the truth of Mr. Glover's observations, but with some limitation. They were led to believe that the wet meter as now made was liable to grave and serious errors, both against the manufacturer and the consumer. He thought that could hardly be the case. The tilting of the meter in the way described by Mr. Glover could hardly be carried to any considerable extent without being detected by the inspecting officer of the company on the one hand or by the consumer on the other. The variation in the level of the water was permitted to the extent of 5 per cent.—2 per cent. against the consumer and 3 per cent. against the company. Protection was given to the consumer by a self-acting arrangement which shut off the supply as soon as the point was reached, which gave a register of 3 per cent. in favour of the company. He had inspected many hundreds of wet meters, but had never found such a variation as had been mentioned in the paper. As to the question of pressure, he denied that it had any effect upon the registration of the meter unless in connection with increased speed of the measuring wheel. This indeed he had tested, for some years ago he had occasion to make experiments on this point, and he found that working a meter at something like one-tenth of its speed, and trying it up to five times the proper speed, only effected a variation of two to three per cent. Evaporation was an objection which told most against the wet meter, and was one on which its opponents dwelt very strongly, and there certainly was inconvenience from this at times. It was stated that the combination of different metals introduced into wet meters tended to rapid destruction; but they had practical evidence of the long duration of these meters. If there was that violent galvanic action which had been referred to, the meters would long since have been destroyed, and would have gone out of use, because the public would have found them not durable. He therefore thought they were justified in assuming that the wet meter was not so disadvantageous as it had been represented to be. Mr. Glover was mistaken in supposing that all gas-holders were measured by the transferrer previous to the passing of the Sales of Gas Act. He knew that at the present time there were gas-holders that had been graduated by the exact weight of water previously to the passing of that act; and nothing could be more accurate. There was less difference between them and the Exchequer standards than was permitted by the Act. He had nothing to say against the dry meter, but he believed that both that and the wet instrument were capable, if fairly used, of doing equal justice to the consumer and the company. If a wet meter were tilted in an unfair manner, they could not expect it to register correctly. It was as absurd to expect this as to place a clock on a shelf out of level and expect the pendulum to act.

Mr. DEFRIES, as a manufacturer of meters with an angular motion, justified that form of construction, on the ground that it did not carry condensation, but threw off the condensed matter, and deposited it at the base of the meter, where it could always be drawn off without disturbing the meter itself. The notion that the leather of the diaphragm was injuriously affected by the action of the gas upon it was, he said, entirely erroneous.

Mr. BISHOP, speaking only in the character of a gas consumer, expressed himself decidedly in favour of the dry meter.

The CHAIRMAN would now ask the meeting to accord their thanks to Mr. Glover for the very interesting paper he had read, and in doing so he would for a moment consider the position in which this question had been placed before them. He took exception to one or two remarks made in the paper:—First, as to the duty of the Government in matters of this kind; and in the next place, the statement that gasworks were not a nuisance to the neighbourhoods in which they were placed. As to the duty of the Government, he dissented entirely from the view that it was the function of Government to interfere with manufactures of any kind, whether gasmeters or anything else. It devolved upon the consumer to look after his own interests and to employ that meter which he believed to be most just, both to himself and to the gas company.

Mr. GLOVER explained that he had not advocated that the government should interfere with manufacture, but should merely give every facility for the production of gas, as conducing to the public welfare. He entirely concurred in the views expressed by the Chairman as to the importance of the non-interference of Government with trade or manufacture.

The CHAIRMAN, having quoted the paragraph of the paper which had prompted his remark, went on to say he did not hold it was the duty of the Government to interfere with manufactures in any way, and he did not know how they could "protect or encourage" without some sort of interference. He believed the real interests of commerce and of the progress of invention in this country were dependent upon the fullest and most unfettered employment of ingenuity and capital, and that Government protection or interference of any kind was an evil. As regarded gas works, he could not agree that it was desirable they should be placed in the centres of great towns. True, the recent accident which occurred at one of these works might have been prevented by proper precautions, but was there any accident which might not have been prevented by due and proper care? The question was, were not gas works subject to special kinds of accidents, and in the present day ought such elements of danger to be placed in the centres of large populations? He contended that the sooner such evils could be removed, without injustice to those who had invested their capital in them, the better. The paper opened the question as to which was the best instrument for measuring gas as it was delivered from the mains for the use of the consumer. He thought the relative merits of the wet and dry meter depended upon this—which of the two instruments was composed of the most durable materials. In the one case they had metallic mechanism working in water impregnated with ammonia, while the other meter was dependent upon the durability and elasticity of the leather diaphragm. It appeared to him, taking the facts as they stood on both sides — looking also at what had fallen from the speaker who was a manufacturer of both kinds of meters, and judging from experience, the evidence seemed certainly to be in favour of the dry meter, as opposed to the wet, which required a very large amount of attention to secure accurate working. Without condemning the wet meter, which was certainly a most ingenious instrument, he thought that when they looked at the admirable contrivances and beautiful workmanship which were introduced into the dry meters on the table before them, they must incline to the opinion that more permanent accuracy could be obtained by the latter instrument. He was sure they would feel that they were much indebted to Mr. Glover for the manner in which he had brought this subject under the notice of the Society, and he begged to propose a cordial vote of thanks to that gentleman for his paper.

The vote of thanks was unanimously passed.

Mr. GLOVER, in acknowledging the compliment, observed that he thought nothing had been said in the discussion to invalidate the statements made in his paper.

TRICHINIASIS.

Experiments have latterly been made (say Messrs. Travers) at the Veterinary School at Berlin, and formerly at Halle, on the subject of transplanting trichines from one animal to another. Four pigs were used for this experiment. A report was made upon the experiment, from which it appears certain that animals fed with meat diseased with trichines soon have the disease in their own bodies. The animals were fed daily upon trichine meat; they soon became ill, and three of the animals died within twenty-seven to thirty-seven days; the fourth recovered, but it was proved on removing some of the flesh that the animal was full of trichines. A sort of trichine insurance was consequently established, starting with the idea that the spread of the disease would receive a considerable check if the possessor of a diseased animal were to receive a compensation on the announcement of the animal being affected with trichines. This insurance only depended upon the goodwill of the people, and as there were no funds at hand for the statistical calculations or for the requisite subscriptions, another plan was suggested as acceptable, viz., every pig in the country that was killed should be taxed 1 silver groschen (1¼d.), from the proceeds of which tax the possessors of trichine-diseased pigs should receive compensation. This would give a security that meat diseased in that way would not be further used for injurious purposes, as food for other animals, &c.

A writer in the *Boston* (U. S.) *Daily Advertiser* says, "Allow me to state briefly that thorough cooking, pickling, and smoking will destroy trichines in pork, and yet a person may get the disease by eating pork which has been submitted to one or all of these processes, if trichinous. A joint of meat may be boiled or roasted for a long time and still remain uncooked at the centre, as the flowing of the juices on cutting proves. A temperature sufficiently high to coagulate albumen, that is, to check the flow of these and to destroy the pink colour of the flesh, about 170 deg. F., will kill this as well as every other animal parasite, but it must penetrate throughout the mass. Pork thus cooked may be eaten with safety by those who do not object to meat possibly larded with entozoa. The same remarks apply to smoking and salting; the process must be continued until every portion of the muscular tissue has been penetrated by the agents employed. This so rarely happens, however, that it is much safer to add the precaution of thorough cooking. Nearly all the epidemics of trichinous disease in Germany have been caused by eating smoked sausages. With regard to the introduction of trichines amongst our New England swine, it is possible, if any of the conditions spoken of in the article published in your last supplement are fulfilled, that is, the presence here of a recently affected person or animal. Several cases of the disease have occurred in New York and the Western States, and swine infected through them and brought hither, might introduce it amongst us."

Publications Issued.

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A Dictionary of Chemistry and the allied branches of other Sciences, by Henry Watts, B.A., F.C.S., assisted by eminent contributors. *(Longmans.)* Part XXIV. of this work is just issued, and contains articles from "Potassium" to "Pyruvic Acid."

Traite de la Gravure a l'Eau Forte. By Maxime Lalanne. 8vo. Paris.—Etching has of late become extremely popular in France, and M. Lalanne is one of the most able young artists in that style in Paris. This little work is a hand-book for the use of students and amateurs in etching, written with great clearness, and illustrated by plates by the author.

Manuel Pratique et Raisonne de l'Amateur de Tableaux. By Dr. Lachaise. 18mo. Paris.—A handbook for the connoisseur and picture-buyer, by an able writer on art, containing an immense amount of information, in a small space, on the history of art, on the characteristics of the various schools, and of the various masters, picture cleaning, and the bibliography of art.

Notes.

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Horticulture at the Paris Exhibition.—A meeting of horticulturists and others took place on Monday, the 30th April, at South Kensington, in the conservatory of the Royal Horticultural Society. There were present, among others, Messrs. Veitch, Bull, Turner, Laing, Murray, Waterer, Beard, Budd, Blashfield, Lee; Dr. Hogg, Dr. Masters, &c. The invitation of the Imperial Commission for the Paris Exhibition of 1867, requesting British horticulturists to co-operate in an International Horticultural Exhibition, to be held in the Champ de Mars contemporaneously with the Exhibition of Arts and Manufactures, was explained and considered; and it was resolved to accept such invitation for a period not exceeding a fortnight, and to suggest the end of May or beginning of June for the same. It was also resolved that British horticulturists would be willing to co-operate with the British executive in exhibiting specimens of plants and flowers.

New Museum and Library for Bordeaux.—The Maire of Bordeaux has laid before the Municipal Council of that city a proposal for the erection of a public museum and library, the cost of which is estimated at 2,400,000 francs (£96,000). The matter has been referred to the committees of Finance and Public Instruction.

Horses and Cattle in France.—The *Moniteur des Travaux Publics* gives the following statistics relative to horses and cattle in France:—Horses, 3,000,000; asses, 400,000; mules, 330,000; horned cattle, 10,200,000, of which 330,000 are bulls, 2,000,000 bullocks, 5,800,000 cows, and 2,100,000 heifers and steers; calves not more than twelve months old, 4,000,000; sheep and lambs, 35,000,000, of which 26,000,000 are merinos or half-bred marinos; goats and kids, 1,400,000; pigs more than twelve months old, 1,400,000; sucking and other young pigs, 3,900,000. France possesses about thirteen millions of acres of natural meadow land, about half of that quantity of cultivated meadow, and more than sixteen millions of acres of pasture and *landes*, or waste land.

Correspondence.

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The Aneroid Indicator.—Sir,—I shall feel obliged if you will allow me to say, in regard to Mr. R. F. C. Wilson's note in the last *Journal*, that I had on your table an instrument which, when completed, will give far larger indications than those of the aneroid indicator for the same amount of fire-damp, or carbonic acid gas. This instrument I showed to two gentlemen, who thought well of it because it is not affected by alterations of level, pressure of the atmosphere, &c., and is, indeed, purely an indicator. I took some pains to explain to Mr. Wilson that the aneroid indicator is nothing more than an aneroid, and as such is a useful instrument, but that there are a few trifling additions besides the porous tile by which at will it becomes an indicator and ceases to be a barometer.—I am, &c., George F. Ansell.

Royal Mint, May 1, 1866.

MEETINGS FOR THE ENSUING WEEK.

Mon......Farmers' Club, 5½. Discussion on "Increasing the Supply of Animal Food."
Odontological, 8.
Society of Engineers, 7. Mr. P. Jensen, "On the Incrustation of Marine Boilers."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8. Annual Meeting.
Asiatic, 3.
R. United Service Inst., 8½. 1. Chevalier Angelina, "On the means of preventing Sore Back and Galling amongst Horses, Mules, &c., in Military and Transport Services." 2. Captain J. H. Selwyn, R.N., "A new principle of Rifle Projectile for Smooth-bore Artillery, calculated to obviate the necessity for Rifling."
Tues. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. G. R. Burnell, "On the Water Supply of the City of Paris."
Zoological, 8½.
Syro-Egyptian, 7½. Rev. J. Mills, "Discussion on the Dome of the Rock and the Church of the Holy Sepulchre."
Photographic, 8.
Ethnological, 8. 1. Mr. John Crawfurd, "On the Migration of Cultivated Plants in reference to Ethnology." 2. Dr. John Shortt, "On the Fishermen of Southern India."
Royal Inst., 3. Prof. Ansted, "On the Application of Physical Geography and Geology to the Fine Arts."
Wed. ...Society of Arts, 8. Colonel Wilford, "On the Progress of Fire-arms for Military Purposes to their Present State."
Geological, 8. 1. "Sir Philip de M. G. Egerton, Bart., "On a new species of *Acanthodes* from the Coal-shales of Longton." 2. Mr. Harry Seeley, "On the Gravels and Drift of the Fenland." 3. Prof. R. Harkness and Mr. H. Nicholson, "Additional Observations on the Geology of the Lake-country." 4. Prof. R. Harkness and Mr. H. Nicholson, "On the Lower Silurian Rocks of the Isle of Man."
Graphic, 8.
Microscopical, 8. 1. Mr. Jas. Smith, "On a form of Rotating Leaf-holder." 2. Dr. Greville, "New and rare Diatoms."
Literary Fund, 3.
Archæological Assoc., 4½. Annual Meeting.
Thur. ...Antiquaries, 8½.
Royal Inst., 3. Prof. Huxley, "On Ethnology."
Fri ......Astronomical, 8.
Royal Inst., 8. Prof. Ansted, "On the Mud Volcanoes of the Crimea."
R. United Service Inst., 3. Commander R. A. E. Scott, R.N., "Modern Carriages for Heavy Naval Ordnance."
Sat ......Royal Inst., 3. Prof. Huxley, "On Ethnology."
R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

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SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 20th April, 1866.

112. Bill—Harbour Loans.
15. (340 to 343) Railway and Canal, &c., Bills—Board of Trade Reports.
96. Army (Manufacturing Establishments)—Return.

Delivered on 21st April, 1866.

110. Bills—Tithe Rent Charge (Ireland).
113. ,, Turnpike Roads.
115. ,, Glebe Lands (Scotland).
175. Metropolitan Workhouses—Return.
187. British Museum—Accounts.

Delivered on 23rd April, 1866.

116. Bills—Contagious Diseases (amended).
117. ,, Drainage and Improvement of Lands (Ireland).
15. (344) Railway and Canal, &c., Bills—Board of Trade Report.
123. Army—Statement of Savings and Deficiencies.
198. Diseased Cattle—Order in Council.

Delivered on 24th April, 1866.

95. Bills—Drainage Maintenance (Ireland).
111. ,, Grand Juries Presentment (Ireland) (amended).
156. Ships "Scorpion" and "Wyvern;" Ship "Scorpion"—Return.
157. Navy (The "Amazon")—Return.
179. Militia Regiments—Return.
186. Metropolitan Local Government, &c.—First Report.
Public General Acts—Caps. 14 and 15.

Delivered on 25th April, 1866.

119. Bill—Parliamentary Oaths (Lords Amendment).
87. Navy (Turret Ships)—Return.
192. National Portrait Gallery—Ninth Report of Trustees.
195. East India (Educational)—Return.
197. Metropolis Turnpike Roads—Return.
199. Dundee Fraternity of Masters and Seamen—Abstract of Return.
200. Contagious Diseases Bill—Special Report.

SESSION 1865.

446. Import and Export Duties—Return.

Delivered on 26th April, 1866.

191. Reigate Election—Minutes of Evidence.
209. Cork and Youghal Railway Bill—Lords Report.

Delivered on 27th April, 1866.

120. Bill—Exchequer and Audit Departments (amended on Re-commitment.
69. (II.) Railway and Canal Bills—Third Report.
154. Criminals (Scotland)—Abstract of Tables.
189. Brewers, &c.—Accounts.
194. Foreign Sugar—Account.
208. Barony of Farney—Return.

Delivered on 28th April, 1866.

106. Bills—Bankruptcy Law Amendment, &c.
123. „ Marriages (Ireland) (No. 2).
144. Increase and Diminution (Public Offices)—Abstract of Accounts.
205. West African Mail Contract—Correspondence.
214. Cattle Plague—Memorial.

SESSION 1865.

442. (A. X.) Poor Rates and Pauperism (February, 1865 and 1866)—Return (A.)

Delivered on 30th April, 1866.

125. Bills—Land Drainage Supplemental.
126. „ Inclosure.
68. (III.) Trade and Navigation—Accounts (31st March, 1866).

Patents.

◆

From Commissioners of Patents' Journal, April 27th.

GRANTS OF PROVISIONAL PROTECTION.

Achromatic object glasses—920—W. Wray.
Aerated liquids, drawing off—1035—W. Clark.
Aniline, obtaining colouring matters from—938—A. L. M. Guétat.
Aniline red, obtaining—968—A. A. Jaeger.
Aniline yellow, obtaining—904—A. A. Jaeger.
Animal charcoal, reburning—952—J. Robey.
Animal charcoal, treating—1005—G. Gordon.
Animals, troughs for feeding—972—G. Rumbelow.
Anti-friction bearings—989—A. B. de Gablenz.
Articles, fastenings for—1011—W. Clark.
Artificial tea, making—690—H. F. Davis.
Bituminous matters—871—J. Buckingham.
Blast furnaces, utilizing gases from—1023—J. Sparrow and S. Poole.
Bridges, foundations of—1022—W. Robotham.
Bung-turning lathe—1025—J. Kennan.
Carding machines, feeding fibres to—1000—W. Clissold.
Carpets, &c.—964—W. E. Newton.
Cast steel, casting articles of—1001—A. V. Newton.
Checks, numbering—988—J. Fraser.
Cotton waste, recovering—1010—F. L. Bauwens.
Cramps—918—J. F. C. Carle.
Crinolines—1024—W. Clark.
Cylindrical bodies—901—W. Deakin and J. B. Johnson.
De-sulphuration—1017—G. Davies.
Distilling—992—J. Young.
Double fabrics—994—J. Patterson.
Dynamometric apparatus—924—W. Pendry.
Elastic fabrics—986—W. Cole.
Electric telegraphs—932—S. M. Martin, S. A. and F. H. Varley.
Fats and oils, pancreatic emulsions of—944—J. Schweitzer.
Fibrous substances, preparing, &c.—1031—G. A. Ermen.
Fire-arms, breech-loading—789—J. H. Johnson.
Fire-arms, breech-loading—916—G. Sturrock.
Fire-arms, breech-loading—1033—J. Crofts.
Fire-arms, revolving—997—E. T. Hughes.
Fragile articles, receptacles for—1027—S. W. Silver and A. Hayward.
Furnaces—1029—W. Young.
Gloves, fastening for—998—C. E. Brooman.
Grain and raw spirit, treating—985—W. R. Taylor and G. Hewett.
Gun cotton, preparing and treating—953—E. C. Prentice.
Houses, heating—1003—G. Davies.
Hydrostatic presses—958—A. A. Hely and J. Marshall.
Juices or saps of trees, solidifying—934—E. P. H. Vaughan.
Latitude, &c., ascertaining—946—J. M. Rowan and A. Morton.
Leather-splitting machines—926—E. T. Hughes.
Liquids, ejecting and applying—906—H. J. F. H. Foveaux.
Liquids, measuring—908—J. and J. Parkes.
Magic photography—987—W. Grune.
Metal bolts and rods—879—W. Boggett.
Motive power, obtaining—752—F. G. A. Horstmann.
Motive power, obtaining—804—G. Zanni.
Oil, volatile—1021—E. Lichtenstadt.
Pianofortes, double-action—950—G. Haseltine.
Pipes, &c., moulding—1007—J. Foster and J. Hollinrake.
Portable dark chambers—980—E. Cox.
Railway carriages, breaks for—886—J. Pichardson and J. Tait.
Receptacles, fastenings for—1013—W. Rawlings and W. Rest.
Rocks, boring—974—S. Richards.
Rolling and clod crushing—266—J. Spencer.
Safes—552—J. C. and H. J. Haddan.
Safes—930—G. Hindshaw.
Safes—954—J. Maddocks and W. Dunn.
Sails, reefing and furling—970—G. Allix.
Sewage, utilizing—1026—G. W. Shinner.
Ships—856—T. E. Symonds.
Shuttles—928—A. Bullough.
Smoky chimneys, preventing—991—W. Cooke.
Soda waste, separating sulphur from—1016—P. W. Hofmann.
Steam engine, registering steam in the cylinders of—923—G. White.
Steam pumps—853—W. Clark.
Steering indicators—978—C. J. Viehoff and J. A. Matthiessen.
Structures, roofs of—962—W. Howitt.
Substances, breaking—1028—J. Frost.
Substances, preventing the putrefaction of—921—J. Davis.
Sugar, treating—960—J. H. Johnson.
Sulphuric acid—1002—E. K. Muspratt.
Surfaces, engraving—1019—R. Leake, W. Shields, and J. Beckett.
Train intercommunication—966—S. M. Martin and S. A. Varley.
Vessels, paddle-wheels for propelling—728—W. E. Newton.
Weaving, looms for—912—W. R. Lake.
Weaving, looms for—942—W. and J. Chew, and W. J. Lucas.
Weaving, looms for—1004—J. L. Davies.
Wheel-work, fly for regulating—870—P. Stieffel.
Yarn, &c., dressing and polishing—936—W. Hill and T. Whitehead.
Yarns, &c., sizing or dressing—940—R. Dewthurst.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Aquatic fireworks—1141—F. Barnett.
Looped fabrics—1114—F. E. Woller.
Sheet iron—1121—G. Haseltine.

PATENTS SEALED.

2786. H. Larkin.
2791. R. D. Dwyer.
2792. A. Braquenié.
2795. W. Deakin & J. B. Johnson.
2802. T. F. Cashin and J. F. Allender.
2803. R. Cassels and T. Morton.
2805. C. Emmet.
2806. M. Bayliss.
2809. E. A. Phillips.
2810. J. Sellars.
2813. A. Boissonneau.
2820. J. Curtis.
2821. H. Jones.
2825. L. Schad.
2826. E. Rushton.
2835. H. Bessemer.
2836. F. Tolhausen.
2838. J. B. Elkington.
2839. R. Smith, jun.
2849. P. B. O'Neill.
2857. W. T. Hamilton.
2902. C. W. Jones.
2911. W. T. Hamilton.
2976. T. B. Heathorn and J. H. G. Wells.
3056. H. A. Bonneville.
260. W. H. Barlow.
350. W. Spencer and T. B. Cutts.
449. C. Gilpin.
510. M. J. L.-y-Munoz.

From Commissioners of Patents' Journal, May 1st.

PATENTS SEALED.

2827. W. E. Dobson.
2837. J. J. McComb.
2840. G. Wilson and W. K. Hydes.
2845. H. Radcliffe.
2846. A. Jemmett.
2848. W. Brett.
2850. J. King and A. Watson.
2852. W. Gardner.
2859. A. Paraf.
2860. R. C. Mansell.
2862. W. Hebdon.
2865. W. Esplen and J. Clarke.
2868. H. Bateman.
2873. F. G. Bennett.
2880. J. H. Johnson.
2886. W. D. Allen.
2888. T. Berrens.
2892. T. Redwood.
2898. E. J. Davis.
2909. W. Reid.
2912. P. Ellis.
2936. H. Clifton.
3009. T. Redwood.
3033. J. H. Johnson.
3040. W. E. Newton.
3048. W. E. Gedge.
3141. W. E. Newton.
3143. N. Salamon and W. J. L. Davids.
65. J. H. Johnson.
236. G. T. Bousfield.
258. J. M. A. Montclar.
261. G. T. Bousfield.
330. G. Gwynne.
353. W. Renney.
763. J. F. Belleville.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1033. J. P. and E. B. Nunn.
1079. E. and F. A. Leigh.
306. T. L. Jacobs.
1020. R. Lavender.
1029. R. Lavender.
1029. L. de Breanski.
1035. L. A. J. Bruet.
1047. H. E. Carchon and E. F. Raybaud.
1053. F. Bennett.
1056. W. Hudson and C. Catlow.
1061. S. Crabtree.
1098. W. G. Craig.
1247. J. Beaumont.
1092. C. P. Stewart & J. Kershaw.
1118. E. Chesshire.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1111. L. R. Blake.
1051. J. H. Johnson.
1109. W. Sellers.
1050. J. H. Johnson.
1082. W. Winstanley and J. Kelly.
1065. C. Randolph and J. Elder.
1075. W. McI. Cranston.